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Purification of Cannabis Extracts using Polysaccharide-Based 'Nanosponge' Adsorbents

Speaker: Dr. Christopher J. Cordier, Head of Chemistry Research, Grow Group PLC

Abstract: Challenges associated with cannabis extraction and purification usually relate to the separation of bioactive compounds from mixtures of physiochemically similar plant components present in crude extracts. Optimizing extraction selectivity for target species while minimizing the co-extraction of unwanted contaminants can suffer from reduced extraction efficiency, lower yields, and batch inconsistency. Innovations in separation technology to purify complex extract mixtures can require high equipment costs and bespoke skillsets to operate.

We describe development of cyclodextrin-derived nanosponges that selectively bind hydrophobic cannabinoids and terpenes by encapsulation within uniquely shaped molecular-scale cavities. This adsorbent material permits facile separation of bioactive ingredients in solution by selectively binding target cannabinoids in preference to unwanted contaminants. Simple filtration of insoluble adsorbent particles is followed by washing to remove waste materials and provides free-flowing powder containing hydrophobic compounds immobilized within the nanosponge core. This matrix permits facile handling and provides a stable environment for cannabinoid storage. Recovery of therapeutic ingredients is achieved by elution from the adsorbent using subcritical CO2 providing solvent-free output suitable for formulation or recrystallization to API.

The polysaccharide-based adsorbent is recyclable and suitable for reuse at least ten times without reduced separation efficiency. This sponge serves as a low-cost alternative to distillation and chromatography and requires minimal technical skill to deploy. This technology does not require dried biomass as a feedstock and is suitable for use with freshly harvested cannabis. Our workflow is routinely performed under ambient conditions, thereby avoiding cryogenic temperatures and elevated pressures and can be performed using generic off-the-shelf equipment.